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New maximum lengths for the freshwater blenny (*Salaria fluviatilis* Asso, 1801) and length comparison between continental and island rivers

by

Martin LAPORTE* (1, 9), Joseph MATTEI (2), Philippe PERRET (3), Bernard ROCHÉ (4), Dolors VINYOLES (5), Menachen GOREN (6), Mahmoud BACHA (7), Zemouri MOURAD (7), Quim POU I ROVIRA (8), Patrick BERREBI (1) & Pierre MAGNAN (9)

Résumé. – Nouvelle taille maximale de la blennie fluviatile (*Salaria fluviatilis* Asso, 1801) et comparaison de la longueur des individus entre les régions continentale et insulaire.

Les volumes de références et les bases de données d'ichtyologie suggèrent que la taille maximale de la blennie fluviatile est de 150 mm (longueur totale, LT). Cependant, aucun spécimen mesurant plus de 111,8 mm (longueur standard, LS ; 133 mm TL) n'a été rapporté dans la littérature. Dans cet article, nous proposons une liste des blennies les plus longues retrouvées dans plus de 52 sites, distribués dans huit pays, afin de documenter ce trait de vie de cette espèce. Cette liste a été établie à partir de diverses bases de données et de la littérature. Nos résultats indiquent que la plus longue blennie mesurée à ce jour est de 154 mm [LT] et qu'elle a été échantillonnée dans la rivière Bravona, Corse (France). De plus, nos résultats suggèrent que les rivières corses accueillent des individus de plus grande taille que celles des rivières continentales.

Key words. – Bleniidae - Fish size - Corsica - Freshwater blenny.

Basic text books and fish databases state that the freshwater blenny (*Salaria fluviatilis* Asso, 1801) has a maximum size of 150 mm (Spillman, 1961; Krupp and Schneider, 1989; Keith and Allardi, 2001; Roché, 2001; Keith *et al*., 2011; Froese and Pauly, 2012). After examining the scientific literature, we found the original reference for this size limit in *Les Poissons des eaux douces de la France* (Roule, 1925). This reference did not report any measurements of freshwater blenny, but states that "*les adultes dépassent rarement 8 ou 10 centimètres, et atteignent au plus 14 à 15 centimètres*" ["adults are rarely longer than 8 or 10 cm, and reach a maximum of 14 to 15 cm"].

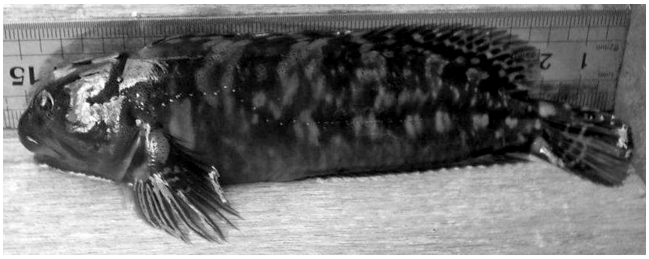

Figure 1. - Longest freshwater blenny measured to date. Total length: 154 mm; 15 Sept. 2012, Bravona River, Corsica (France).

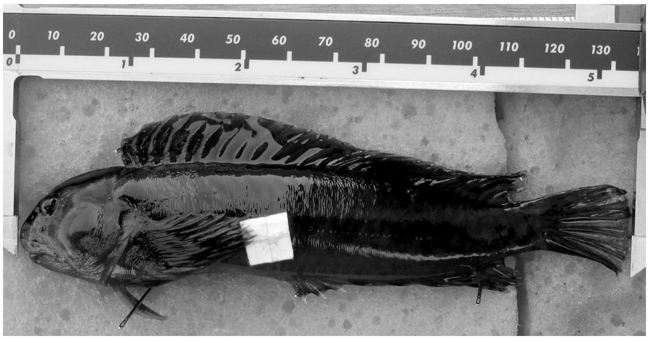

Figure 2. - Freshwater blenny sampled in the Rizzanese River, Corsica (France). Total length = 135.6 mm; Standard length = 117.5 mm (see text for details).

The goal of the present paper is to list the longest blennies found at 52 sites distributed over eight countries (Algeria, France/

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(1) Institut des sciences de l'évolution de Montpellier, UMR 5554 UM2-CNRS-IRD, Université Montpellier II, CC065, Place E. Bataillon, 34095 Montpellier CEDEX 5, France.

(2) L'Office national de l'eau et des milieux aquatiques en Corse, Lieu-dit Guazza-Perunelli di Casacconi, 20290 Borgo, France. [joseph.mattei@onema.fr]

(3) Centre d'écologie fonctionnelle et évolutive, CNRS Montpellier, 34293 Montpellier CEDEX 5, France. [philippe.perret@cefe.cnrs.fr]

(4) Service de l'eau et des milieux aquatiques, Direction régionale de l'environnement de l'aménagement et du logement de Corse, Route d'Agliani, Montesoro, 20600 Bastia, France. [Deceased; we dedicate this paper to our late colleague.]

(5) Department of Animal Biology, Universitat de Barcelona, Avinguda Diagonal 643, 08028, Barcelona, Spain. [d.vinyoles@ub.edu]

(6) Department of Zoology, George S. Wise Faculty of Life Sciences, Tel-Aviv University, Tel-Aviv 69978, Israel. [gorenm@tauex.tau.ac.il]

(7) Université A. Mira, Laboratoire d'écologie et environnement, Route de Targua Ouzemour, Bejaïa 06000, Algeria. [mahbac@gmail.com]

(8) Sorelló, estudis al medi aquàtic, Plaça St. Pere 15, Baixos, 17007 Girona, Spain. [quim.pou@sorello.net]

(9) Centre de recherche sur les interactions bassins versants – écosystèmes aquatiques (RIVE), Université du Québec à Trois-Rivières, CP 500, Trois-Rivières, G9A 5H7, Québec. [pierre.magnan@uqtr.ca]

* Corresponding author [uni.mlaporte@gmail.com]

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Table I. - Longest freshwater blennies sampled in different rivers of the world. TL = total length (snout to the end of the caudal fin); SL = standard length (snout to the posterior end of the last vertebra); NA = not available; bold = longest blenny in a region/country; italic = longest blenny previously recorded in the scientific literature.

Country	River/lake name	TL (mm)	Date	Reference
Algeria	**Agarioun**	**153**	**2012 Jul. 29**	**Present study**
	Soumman	125	2007 Apr. 25	Present study
France	Agly	82	2007 Jun. 28	Present study
	Aiguebelette	70	1995 Jul. 01	Present study
	Annecy	79	2009 Oct. 11	Present study
	Arc à Berre	102	1987 Jun. 29	Present study
	Argens	**123**	**2003 Sep. 23**	**Present study**
	Aude	100	1981 Sep. 22	Present study
	Bourget	64	2009 Nov. 20	Present study
	Crieulon	100	2007 Jun. 04	Present study
	Fresquel	120	2000 Sep. 20	Present study
	Leysse	96	2001 May 29	Present study
	Leysse	*74.4 (SL)*	*2001 Jul. 20*	*Kottelat, 2004*
	Rhônes	109	2004 Nov. 17	Present study
	Rotja	120	2008 Aug. 29	Present study
	Sierre	96	2000 May 04	Present study
	Tech	115	1997 Sep. 01	Present study
	Tech	*83.0 (SL)*	*2002 Sep. 06*	*Kottelat, 2004*
	Touloubre	80	1985 Jun. 11	Present study
	Var	114	2006 Aug. 30	Present study
	Var	*85.0 (SL)*	*2002 Oct. 03*	*Kottelat, 2004*
	Vidourle	66	2009 Sep. 23	Present study
France/ Corsica	Abatescu	122	2009 Jul. 24	Present study
	Bevincu	125	2009 Jul. 23	Present study
	Bravona	**154**	**2012 Sep. 15**	**Present study**
	Casaluna	118	2009 Sep. 14	Present study
	Fangu	120	2006 Sep. 05	Present study
	Fangu	*94*	*2001*	*Neat* et al.*, 2003*
	Fium altu	109	2007 Jun. 22	Present study
	U Fium'Orbu	137	2007 Jun. 21	Present study
	Fiumicelli	114	1996 Sep. 30	Present study
	Golu	116	2009 Sep. 02	Present study
	Gravona	130	2005 Oct. 19	Present study
	Liamone	128	2001 Aug. 28	Present study
	Prunelli	111	2007 Sep. 14	Present study
	Rizzanese	135.6	2008 Oct. 07	Present study
	Solenzara	113	1996 Oct. 01	Present study
	Tagnone	134	2008 Apr. 25	Present study
	Taravu	129	2007 Sep. 05	Present study
	Tartagine	115	2005 Jun. 14	Present study
	Tavignanu	135	2009 Jun. 26	Present study
France/ Switzerland	**Léman**	**91**	**May 2010**	**Raymond *et al.*, 2010**
	Maggiore	60.5 (SL)	1985 Aug. 25	Kottelat, 2004
Greece	Kournas	56	2002	Neat *et al*., 2003
	Pinios	**111.8 (SL)**	**2002 May 14**	**Kottelat, 2004**
Israel	**Kinneret**	**101**	**1991 Jul. 04**	**Present study**
	Kinneret	*Between 94 and 96*	*1991-1992*	*Gasith and Goren, 2009*
Italy	**Garda**	**75**	**2002**	**Neat *et al*., 2003**
Morocco	**Mella**	**120**	**1921**	**Pellegrin, 1921**
	Ouerrha	50.1 (SL)	NA	Doadrio *et al*., 2011

Table I. - Continued.

Country	River/lake name	TL (mm)	Date	Reference
Spain/ Catalonia	Banyoles	119	1999 Sep. 02	Present study
	Banyoles	*96.4 ± 3.7*	*NA*	*Barata* et al., *2008*
	Ebro	111	2003 Jul. 09	Present study
	Ebro	*63.4 (SL)*	*Oct. 2001*	*Kottelat, 2004*
	Fluvià	128	2006 Jul. 21	Present study
	Matarranya	65	2003 Jun. 20	Present study
	Matarranya	*62.5 ± 2.1*	*1984*	*Vinyoles and Sostoa, 2007*
	Noguera Pallaresa	107	2008 Feb. 09	Present study
	Ter	**133**	**2006 Apr. 14**	**Pou-Rovira *et al*., 2007**
Worldwide	**Bravona**	**154**	**2012 Sep. 15**	**Present study**
	Ter	*133*	*2006 Apr. 14*	*Pou-Rovira* et al., *2007*

Corsica, Switzerland, Greece, Israel, Italy, Morocco, and Spain/Catalonia). Blenny measurements were obtained from i) the scientific literature, ii) the database of the *Office national de l'eau et des milieux aquatiques* (ONEMA), a French governmental organization responsible for aquatic environmental quality, and iii) our personal databases. The ONEMA database contains fish sampled since 1981 from different rivers and streams in France. More than 4000 freshwater blennies are recorded in this database. Our personal databases contain the sizes of more than 3000 specimens from 23 sites sampled in four different countries distributed around the Mediterranean Sea (Algeria, France/Corsica, Israel, and Spain/Catalonia), between 1991 and 2012.

We also compared fish lengths between rivers in Corsica and mainland France to determine if there were any differences between these two geographical areas. A total of 939 specimens from continental rivers (sampled between 22 September 1981 and 18 November 2009) and 3159 specimens from Corsican rivers (sampled between 6 September 1988 and 14 September 2009), all from the ONEMA database, were evaluated.

Largest specimens confirmed to date

Overall, considering all data available as well as the scientific literature, the longest freshwater blenny measured to date is 154 mm (total length, TL); from the snout to the end of the caudal fin) and was sampled on 15 September 2012 in the Bravona River, Corsica, France (Fig. 1). The two longest blennies reported in the literature were sampled from the Pinios River in Greece on 4 May 2002 and measured 111.8 mm (standard length, SL); snout to the posterior end of the last vertebra or roughly the TL without the caudal fin; Kottelat, 2004) and from the Ter River in Spain on 14 April 2006, measuring 133 mm TL (Pou-Rovira *et al*., 2007). Unfortunately, we cannot estimate with accuracy the TL of the Greek blenny, because we do not have any other information about the relationship between TL and SL for blennies in this river. However, a rough comparison of these two specimens (Bravona *vs* Pinios River) was possible when comparing TL and SL of a specimen photographed in the Rizzanese River on 13 August 2009 (Fig. 2). This specimen has a total length of 135.6 mm and a standard length of 117.5 mm. This suggests that the caudal fin of the blenny from the Pinios River would have to be more than 17.6% of its TL to be longer than 135.6 mm (compared to that from the Rizzanese River, which is 13.3% of the TL).

Among the European continental coastal rivers, only the individual from the Ter River and possibly the Pinios River specimen measured 130 mm or more. In comparison, 9 fish that were 130 mm (TL) or longer were sampled in Corsica between 1988 and 2009. Table I gives the complete list of the longest blennies sampled in

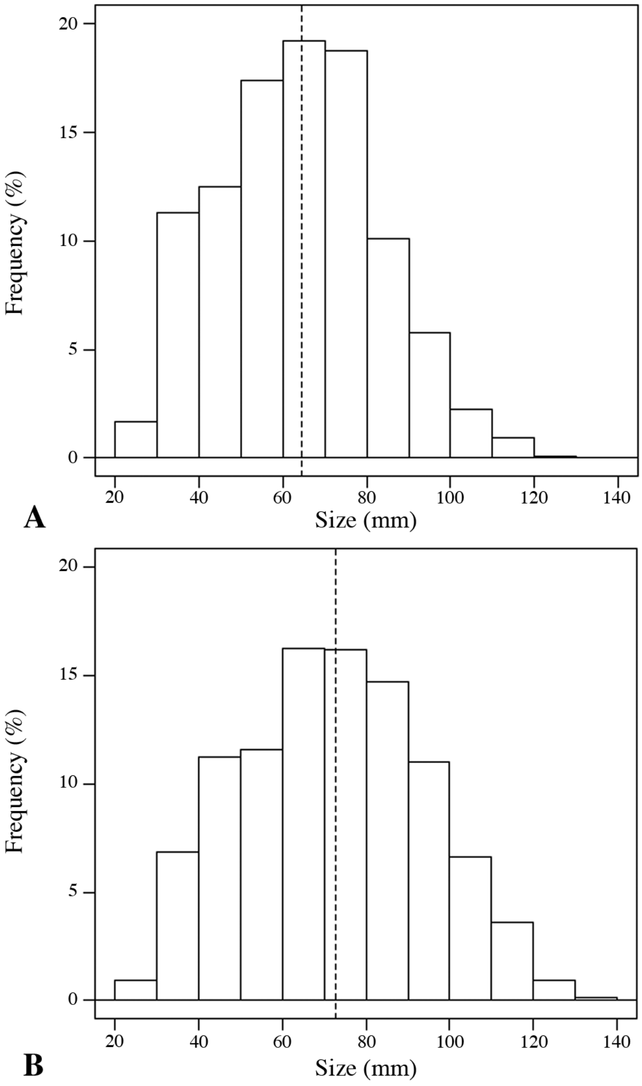

Figure 3. - Size distribution of freshwater blennies sampled in two regions. **A**: 939 fish sampled in continental rivers of France between 1981 and 2009; **B**: 3159 fish sampled in Corsican rivers between 1988 and 2009. Fish size distributions in the two regions were significantly different (p-value < 0.001). Dashed lines represent distribution means. Mean fish length was 65.6 mm in continental rivers of France (A) and 72.9 mm in Corsican rivers (B), and were significantly different (p-value < 0.001).

the 52 sites. The longest blenny measured in Africa was sampled in 2012 in Oued Agarioun, Algeria, and measured 153 mm (TL; Tab. I). In the Middle East, a specimen of 101 mm (TL) was sampled in Kinneret Lake in 1991 (Tab. I). The longest blenny in alpine lakes was sampled in Leman Lake (a.k.a. Geneva Lake) and measured 91 mm (TL; Raymond *et al.*, 2010).

Mean length and distribution of fish

The mean size of blennies from continental rivers of France was 65.6 mm (TL) and significantly smaller to the one of 72.9 mm (TL) from Corsican rivers (Welch two-sample t-test: $t = 11.1$; $df = 1742.4$; p-value < 0.001). Size distributions from the two areas were significantly different (Chi-square test: $\chi^2 = 141.2$; $df = 11$; p-value < 0.001; Fig. 3).

DISCUSSION

Our survey of freshwater blenny size reveals that the maximum length (TL) measured for this species is 154 mm. This fish was caught in the Bravona River, Corsica. In comparison, the longest fish sampled from European coastal rivers was 133 mm (TL) in the Ter River, Spain. Because the nine other European specimens longer than 130 mm were sampled in Corsica, these observations suggest that some Corsican rivers may provide environmental conditions that favour greater growth and/or longevity of this species. This is supported by the comparison of fish lengths between French continental and Corsican rivers. Mean fish size was significantly higher on Corsica than in French continental rivers. However, a study based on otoliths should be necessary to determine if the difference in mean size could be explained by differences in growth, longevity or both. This species is considered sensitive to human perturbation in terms of water pollution (Hernández *et al.*, 2000; Laporte *et al.*, in press), habitat destruction/alterations (Ferrito and Tigano, 1996; Aparicio *et al.*, 2000), introduction of exotic fish species (Elvira, 1995), and excessive water removal from river (Changeux and Pont, 1995; Collares-Pereira *et al.*, 2000). Better habitat preservation in Corsican streams, among several other ecological parameters, might explain the larger size of blennies in this region. Furthermore, it is also possible that a different genetic lineage in Corsica could explain this differentiation in size between both regions.

Finally, our results could be used as a starting point for further studies on factors that affect growth and/or longevity of this species. Considering that abundance has declined in most riverine populations due to habitat alteration (Doadrio, 2001; Keith and Allardi, 2001; Kottelat and Freyhoff, 2007; Vinyoles and Sostoa, 2007; Persat, 2011), this information will be necessary for freshwater blenny management and conservation in the Mediterranean area.

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